REMARKS

This paper is being provided in response to the Final Office Action mailed February 5, 2004, for the above-referenced application. In this response, Applicants have cancelled claims 1-6 and 13-14 without prejudice or disclaimer of the subject matter thereof, amended claim 7 and added new claims 15-17 to clarify that which Applicants consider to be the invention. Applicants respectfully submit that the amendments to the claims and the new claims are fully supported by the originally-filed specification.

The rejection of claim 7 under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 5,962,083 to Hatanaka et al. (hereinafter "Hatanaka") in view of U.S. Patent No. 5,364,665 to Felts et al. (hereinafter "Felts") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claim contained herein.

Independent claim 7, as amended herein, recites an apparatus for forming a silicon oxide film on a substrate by the use of a plasma CVD method. The apparatus comprises a plasma generating region which forms plasma of first gas oxygen atoms, a deposition region which is placed on a substrate so as to be separated from the plasma generating region, a grounded barrier disposed between the plasma generating region and the deposition region through which excitation oxygen molecules and excitation oxygen atoms pass into the deposition region from the plasma generating region, a supply unit which supplies second gas containing silicon atoms into the deposition region, and a control unit which controls a pressure of the deposition region and which intentionally controls first quantity of the excitation oxygen molecules and second quantity of the excitation oxygen atoms. Further, the grounded barrier includes at least one

opening that connects the plasma generating region to the deposition region, and wherein said at least one opening has a diameter that is less than or equal to the Debye length of the plasma. Claims 8-12 depend on independent claim 7.

The Hatanaka reference discloses a method of depositing a thin film on a polymer substrate by plasma CVD. The method included introducing a gas into a plasma generating chamber wherein an ECR (electron cyclotron resonance) plasma is generated, passing the plasma through a mesh provided between the gas inlet and a polymer substrate located downstream of the inlet, and depositing a film on the surface of the polymer substrate. (See Abstract and Figure 1 of Hatanaka.)

The Felts reference discloses a plasma treating apparatus comprising an evacuable chamber, an electrically powered electrode defining a plasma-facing surface within the chamber, and a shield spaced a distance Δ transverse to the plasma-facing surface.

Applicants' independent claim 7 recites at least the features of an apparatus for forming a silicon oxide film on a substrate includes a ground barrier disposed between the plasma generating region and the deposition region and *wherein the grounded barrier includes at least one opening that connects the plasma generating region to the deposition region, and wherein said at least one opening has a diameter that is less than or equal to the Debye length of the plasma.* Applicants have found that a result of the openings in the ground barrier connecting the plasma generating region to the deposition region having diameters of less than the Debye length of the plasma, ions and electrons generated in the plasma generating region cannot invade or

enter into the deposition region. This allows the density of the ions or electrons to be ignored near the substrate, and a higher quality silicon oxide film is provided. (See, for example, page 11, lines 1-5 and Figures 3 and 4a of the present application.)

Applicants respectfully submit that neither Hatanaka nor Felts, taken alone or in combination, teach or fairly suggest at least the above noted features as claimed by Applicants. The Office Action cites the mesh 14 of the Hatanaka reference as disclosing a grounded barrier like that disclosed by Applicants. However, Hatanaka does not disclose the specific size limit, namely the Debye length of the plasma, that is claimed by Applicants with respect to the dimensions of the openings through which the excitation oxygen molecules and excitation oxygen atoms pass into the deposition region, but which does not allow to pass the electrons and ions of the plasma.

Applicants submit that Felts fails to overcome the deficiencies of the Hatanaka reference with respect to Applicants' claimed invention. Felts makes no mention of a grounded barrier having the characteristics as claimed by Applicants. Accordingly, in view of the above, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 8-12 under 35 U.S.C. 103(a) as being unpatentable over Hatanaka in view of Felts and further in view of Japanese Patent Publication 2000-055733 to Soma (hereinafter "Soma") and U.S. Patent No. 5,953,118 to O'Rourke et al. (hereinafter "O'Rourke") is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claims 8-12 depend on independent claim 7, as discussed above with respect to the Hatanaka and Felts references.

The Soma reference discloses a multi-channel spectroscope. The Office Action cites Soma as disclosing a multi-channel optical emission spectrometer.

The O'Rourke reference discloses a multiplexed spectrophotometry system. The Office Action cites O'Rourke as disclosing a thermoelectric cooling CCD capable of exposure times from approximately 0.02 seconds to more than 30 seconds.

Applicants respectfully submit that both Soma and O'Rourke fail to overcome the above-noted deficiencies of Hatanaka and Felts with respect to Applicants' claimed invention. Specifically, neither Hatanaka, Felts, Soma nor O'Rourke, taken alone or in any combination, teach or fairly suggest at least the features of an apparatus for forming a silicon oxide film on a substrate includes a ground barrier disposed between the plasma generating region and the deposition region and *wherein the grounded barrier includes at least one opening that connects the plasma generating region to the deposition region, and wherein said at least one opening has a diameter that is less than or equal to the Debye length of the plasma*, as is claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claim 7 under 35 U.S.C. 103(a) as being unpatentable over Felts in view of U.S. Patent No. 6,044,792 to Ogawa et al. (hereinafter "Ogawa") and further in view of Hatanaka is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

The features of independent claim 7 are discussed above with respect to the Felts and Hatanaka references.

The Ogawa reference discloses a plasma CVD apparatus. The Office Action cites Ogawa as disclosing a plasma CVD apparatus in which the plasma generating region is separate from the deposition region.

Applicants respectfully submit that Ogawa fails to overcome the above-noted deficiencies of Felts and Hatanaka with respect to Applicants' claimed invention. Specifically, neither Hatanaka, Felts nor Ogawa, taken alone or in any combination, teach or fairly suggest at least the features of an apparatus for forming a silicon oxide film on a substrate includes a ground barrier disposed between the plasma generating region and the deposition region and *wherein the grounded barrier includes at least one opening that connects the plasma generating region to the deposition region, and wherein said at least one opening has a diameter that is less than or equal to the Debye length of the plasma*, as is claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

The rejection of claims 8-12 under 35 U.S.C. 103(a) as being unpatentable over Felts in view of Ogawa and further in view of Hatanaka, Soma and O'Rourke is hereby traversed and reconsideration is respectfully requested in view of the amendments to the claims contained herein.

Claims 8-12 depend on independent claim 7, as discussed above.

Felts, Ogawa, Hatanaka, Soma and O'Rourke are all discussed above.

As noted above, Applicants respectfully submit that neither Hatanaka, Felts, Ogawa, Soma nor O'Rourke, taken alone or in any combination, teach or fairly suggest at least the features of an apparatus for forming a silicon oxide film on a substrate includes a ground barrier disposed between the plasma generating region and the deposition region and *wherein the grounded barrier includes at least one opening that connects the plasma generating region to the deposition region, and wherein said at least one opening has a diameter that is less than or equal to the Debye length of the plasma*, as is claimed by Applicants. Accordingly, Applicants respectfully request that this rejection be reconsidered and withdrawn.

Further, Applicants have added new independent claims 15-17 and respectfully submit that these claims are patentable over the prior art of record and are fully supported by the originally-filed application. (See, for example, page 11, lines 10-27 and Figs. 2, 3 and 4b of the present application.) Specifically with respect to claim 17, this claim recites that the grounded barrier contacts with the periphery of the chamber. This feature is supported by the content of

the specification and the apparatus structure described and illustrated in Fig. 2. Applicants direct attention to the difference between the apparatus in Fig. 1 and that of Fig. 2. In the apparatus in Fig. 1, the grounded barrier does not contact with the periphery of the chamber. In a structure in which the grounded barrier does contact with the periphery of the chamber, as claimed by Applicants, the plasma which exists at the periphery of the chamber can be prevented from leaking from the plasma generating region into the deposition region. By contrast, in Hatanaka, the mesh plate does not contact with the periphery of the chamber (see col. 3, line 57 to col. 4, line 3). Consequently, in Hatanaka, it is difficult to prevent the plasma which exists at the periphery of the chamber from leaking from the plasma generating region into the deposition region.

Based on the above, Applicants respectfully request that the Examiner reconsider and withdraw all outstanding rejections and objections. Favorable consideration and allowance are earnestly solicited. Should there be any questions after reviewing this paper, the Examiner is invited to contact the undersigned at 617-248-4038.

Respectfully submitted,
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